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Sensory feedback synchronizes motor and sensory neuronal networks in the neonatal rat spinal cord

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Abstract

© The Author(s) 2016.Early stages of sensorimotor system development in mammals are characterized by the occurrence of spontaneous movements. Whether and how these movements support correlated activity in developing sensorimotor spinal cord circuits remains unknown. Here we show highly correlated activity in sensory and motor zones in the spinal cord of neonatal rats in vivo. Both during twitches and complex movements, movement-generating bursts in motor zones are followed by bursts in sensory zones. Deafferentation does not affect activity in motor zones and movements, but profoundly suppresses activity bursts in sensory laminae and results in sensorimotor uncoupling, implying a primary role of sensory feedback in sensorimotor synchronization. This is further supported by largely dissociated activity in sensory and motor zones observed in the isolated spinal cord in vitro. Thus, sensory feedback resulting from spontaneous movements is instrumental for coordination of activity in developing sensorimotor spinal cord circuits.

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